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U.S. Geological Survey
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Maryland-Delaware-District of Columbia Water Science Center
Seminar Series

Tuesday, February 18, 2014 11:00-12:00

The impact of urban development on groundwater storage in the Baltimore area

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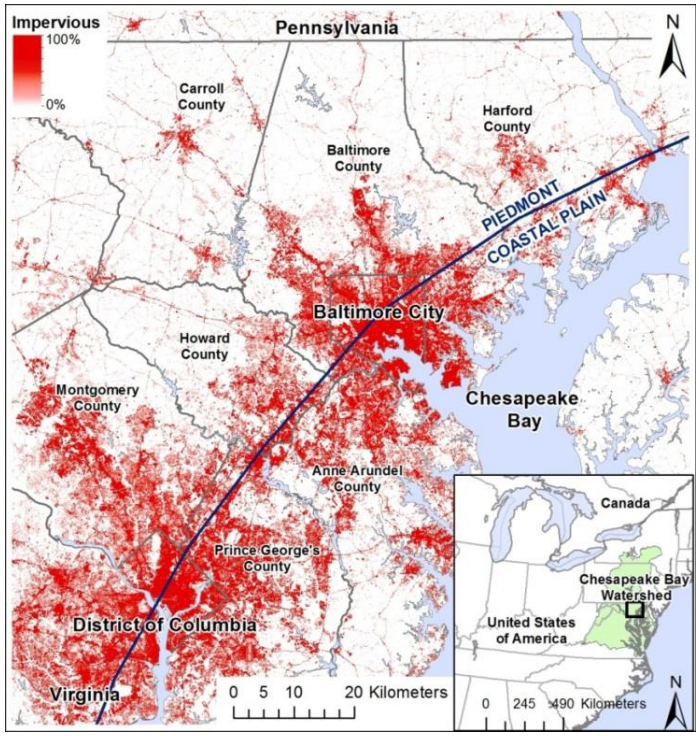
This work quantifies the impacts of urban development on groundwater storage, and groundwater-surface water interactions using intensive data analysis and mathematical modeling. The monthly water balance for the period 2000-2009 for 65 Baltimore area watersheds was calculated using remote sensing data and the rich data set from the dense network of instrumented sites in this region. This analysis included estimation of spatially-distributed anthropogenic fluxes (water supply pipe leakage, lawn irrigation, and infiltration and inflow (I&I) of groundwater and stormwater into wastewater pipes) as well as natural fluxes of precipitation, streamflow, and evapotranspiration. Inflow fluxes of water supply pipe leakage and lawn irrigation were significant but small compared to precipitation, but I&I was approximately equal to gaged streamflow.



Building on knowledge of the altered urban water balance, an integrated hydrologic model of the Baltimore metropolitan region (13,216 km^2) was developed to quantify the impact of urban development on groundwater storage. The three-dimensional groundwater-surface water-land surface model ParFlow. CLM was implemented and a methodology to incorporate urban and hydrogeologic input datasets was developed. Using the model, the impacts of reduced vegetative cover, impervious surface cover, I&I, and other anthropogenic discharge and recharge fluxes were isolated. Removal of I&I led to the largest change in subsurface storage, and removal of impervious surface cover had the smallest effect.

Presentation also available remotely via Webex: https://usgs.webex.com/

For directions to the USGS MD-DE-DC WSC: http://md.water.usgs.gov/directions/baltimore.html.